II. "On a Varying Cylindrical Lens." By TEMPEST ANDERSON, M.D., B.Sc. Communicated by Professor A. W. WILLIAMSON, For. Sec. R.S. Received November 18, 1886.

A cylindrical lens of continuously varying power has long been a desideratum, and one was constructed and described by Professor Stokes, at page 10 of the Report of the British Association for 1849 (Transactions of the Sections). He points out that—

"If two plano-cylindrical lenses of equal radius, one concave and the other convex, be fixed, one in the lid and the other in the body of a small round wooden box, with a hole in the top and bottom, so as to be as nearly as possible in contact, the lenses will neutralise each other when the axes of the surfaces are parallel; and by merely turning the lid round an astigmatic lens may be formed, of a power varying continuously from zero to twice the astigmatic power of either lens."

This very beautiful optical contrivance has the disadvantage that the refraction varies from zero in both directions at once, the refraction at any given position of the lenses being positive in one meridian, and negative or concave to an equal degree in a meridian at right angles to the first; moreover, there is no fixed axis in which the refraction is either zero or any other constant amount. It has in consequence never come into extensive use in the determination of the degree of astigmatism. The author has planned a cylindrical lens in which the axis remains constant in direction and amount of refraction, while the refraction in the meridian at right angles to this varies continuously.

A cone may be regarded as a succession of cylinders of different diameters graduating into one another by exceedingly small steps, so so that if a short enough portion be considered, its curvature at any point may be regarded as cylindrical. A lens with one side plane and the other ground on a conical tool is therefore a concave cylindrical lens varying in concavity at different parts according to the diameter of the cone at the corresponding part. Two such lenses mounted with axes parallel and with curvatures varying in opposite directions produce a compound cylindrical lens, whose refraction in the direction of the axes is zero, and whose refraction in the meridian at right angles to this is at any point the sum of the refractions of the two lenses. This sum is nearly constant for a considerable distance along the axis so long as the same position of the lenses is maintained. If the lenses be slid one over the other in the direction of their axes, this sum changes, and we have a varying cylindrical lens. The lens is graduated by marking on the frame the relative position of the lenses when cylindrical lenses of known power are neutralised.

It was found by a practical optician to be impossible to work glasses on a cone of large diameter, consequently a conical tool was constructed with an angle of 45° at the apex, and 8 inches diameter at the base.

A glass about 4 inches long was ground on the sides of this near the base, and as the resulting lens if ground on plane glass would have been too concave for most purposes, the outer side of the glass was previously ground to a convex cylindrical curve, and its axis applied parallel to the generating line of the cone in the plane of the axis of the cone.

The result was concavo-convex cylinders of varying power suitable for the practical measurement of astigmatism.

Lenses were exhibited varying from 0 to − 6DCy, and from 0 to + 6DCy.

III. "On the Action of the Excised Mammalian Heart." By Augustus Waller, M.D., and E. Waymouth Reid, M.B. Communicated by Prof. Burdon Sanderson, F.R.S. Received November 18, 1886.

(Abstract.)

The graphic method, the galvanometer, and the capillary electrometer were made use of in this research. The animals used were the dog, rabbit, cat, rat, guinea-pig, and sheep. The chief results were as follows:—

1. Spontaneous ventricular contractions, complete and capable of being recorded, continue after excision of the heart for periods which are variable, but which as a rule are longer than has generally been received to be the case (Czermak and Piotrowsky).

2. Spontaneous ventricular contractions frequently outlast auricular contractions, both spontaneous and excited.

3. After spontaneous ventricular contractions have ceased to occur, electrical and mechanical excitations can still provoke contraction.

4. The length of contraction of both auricle and ventricle of the excised heart is very great (15 to 20 times the normal duration), whether the contraction be spontaneous or excited.

5. The length of the latent period increases with the length of contraction; it may be as long as 0·75 sec.

6. These phenomena (4 and 5) depend principally upon the surrounding temperature.

7. The heart (of a rabbit) can regain its excitability and its power of spontaneous contraction after it has been frozen hard.